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February 15, 2001

Magalie Roman Salas
Office of the Secretary
Federal Communications Commission
445 12th St., SW, TW-A325
Washington, DC 20554

CC Docket No. 00-229

Dear Ms. Salas:

Enclosed for filing, please find an original and nine (9) copies of the Reply Comments of the National Association of State Consumer Utility Advocates. A disk containing the Comments is also enclosed.

If you have any questions, please do not hesitate to contact me.

Sincerely,

Theresa V. Czarski
Assistant People's Counsel

TVC:sd
Enclosures

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Before the
FEDERAL COMMUNICATIONS COMMISSION

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In the Matter of)
2000 Biennial Regulatory Review--) CC DOCKET No. 00-229
Telecommunications Service Quality)
Telecommunications Act of 1996)
Reporting Requirements)

**REPLY COMMENTS OF
THE NATIONAL ASSOCIATION OF STATE CONSUMER UTILITY ADVOCATES**

1. The Commission does have authority to impose additional requirements to ensure quality service for all consumers. NASUCA vigorously disagrees with those parties that contend the Commission is limited in this proceeding to either eliminating, modifying or maintaining *current* service quality requirements and has no authority to impose *new* requirements. The Biennial Regulatory Review is not intended to be *the* singular-in-scope framework in which the Commission can determine the adequacy of current service quality requirements.

Rather, the Commission's scope of authority can only be understood in a broader and eminently more appropriate context. First, the federal act amends but does not replace the original 1934 Act; the Commission continues to have the overarching statutory authority *and responsibility* to protect the public interest; if that in turn necessitates the imposition of *additional* service quality requirements, it is that superior public interest standard that trumps the more limited Section 11 Biennial Review standard.

Second, that superior public interest standard is especially clear given the overall purpose of the federal act. As already discussed in NASUCA's initial Comments, the statutory goal of advancing competition was made secondary to the right of all consumers to quality service and lower rates. Limiting the scope of this NPRM so as to preclude the imposition of additional requirements would render the statute's primary goal meaningless.

Third, the original Order that instituted the reporting requirements now under review remains in effect. As part of the express concerns, rationale and requirements stated therein, the Commission made clear its ongoing intent to take any necessary steps in the future to further protect the public interest.

2. Reporting Carriers Should Not Be Allowed to Self-Select which Data is Excluded. NASUCA strongly supports the recommendation of the Public Utilities Commission of Ohio

(PUCO) in its Comments (at pp. 3-4) that local exchange carriers be required to report the data in its “raw” form, i.e, without excluding data due to carrier-invoked exceptions. Illustrative of that need is the fact that among the findings against Ameritech-Ohio in last summer’s service quality proceeding, was the number of exceptions it had claimed (particularly when compared to other Ohio ILECs.)¹

NASUCA agrees that self-selection results in data submitted to regulators that leads to inaccurate conclusions regarding performance. For example, it is typically only during the course of an investigation or audit that it is learned that carriers have *excluded* otherwise reportable data in trouble reports, outage reports, etc. The exclusion is frequently explained away with the rationale that because the problem was “beyond their control”, the ILECs concluded that they had appropriately *not* counted such outages, missed appointments, etc. Among the most frequently cited beyond-their-control culprits are “the weather”, “unexpected growth in demand”, and “unexpected shortages of qualified technicians”.

As to weather, it has been too easy for carriers to contend that flooding or “above-average precipitation” have caused an outage---the classic “Act of God.” But regulators must have available to them the data needed to verify whether in fact the weather is the *cause* or merely the trigger of what in reality is carrier failure to provide and maintain proper and standard insulation that would, for example, have allowed the plant to withstand the “flood” or “above-average precipitation.”

Similarly, “unexpected growth in demand” is routinely cited as a “cause beyond the carrier’s control” when explaining long intervals for the installation of second lines. Yet these same carriers engaged in intense, ongoing and expensive ad campaigns urging customers to add a second line to their home or business. Consumers responded consistent with the projections of the marketers who created those ad campaigns on behalf of the carriers. Thus the growth in demand was neither unexpected nor beyond the carriers’ control inasmuch as the carriers largely stimulated that very demand.

And carriers have in recent years aggressively promoted early-out retirement plans for employees, a strategy that one can reasonably conclude has contributed significantly to a reduction in the level of qualified technicians available. Management then claims to be surprised when their ever increasingly lucrative buyout packages are accepted by their employees.

Self-selection of data leads to distortions that allow performance to appear more favorable than is factual. That result is both anti competitive and anti consumer. Self-selection of data should not become a tool with which carriers escape accountability for their strategic decision to let profits rise at the expense of providing the necessary plant maintenance and repair, the work force adequate in size and training for prompt installation, etc.

¹ See, *In the Matter of the Commission-Ordered Investigation of Ameritech-Ohio Relative to its Compliance with Certain Provisions of the Minimum Telephone Service Standards Set Forth in Chapter 4901:1-5, Ohio Administrative Code*, PUCO Docket No. 99-938-TP-COI, Opinion and Order (July 20, 2000) at pp. 6-13.

Consumers depend on regulatory staff and auditors to obtain the relevant evidence necessary for a determination of the cause of outages and other service problems. Consumers and regulators are not well served when, as is now the case, such improper exclusion of data is only uncovered in investigations and audits. The examples related to weather, unexpected growth in demand, and insufficient work force levels, are but three illustrations of why the recommendation of the Ohio Commission should be accepted; all the data as to outages, missed appointments, etc., must be reported in raw form with no exclusions allowed. Any explanatory notes and appropriate backup substantiation can be noted.

3. Answer Time is important to consumers. Parties including BellSouth contend that the amount of time it takes before a customer's call to the telephone company is answered is not key to customer satisfaction. Unsurprisingly, that contention lacks credible supporting data and should be rejected. The respondents in the survey conducted by the National Regulatory Research Institute (NRRI)² indicated that one minute or less was the *longest* time they should have to wait after selecting the correct option before speaking to a live service representative. In Michigan, for example, customer complaints against Ameritech suggest that wait times of 20-30 minutes are often the norm.

4. From Commission-posted performance data one may conclude that service quality has declined in the aftermath of major mergers. For example, with respect to the SBC/Ameritech merger, see the comparative performance as demonstrated in the results through the 3rd quarter of 2000 found at the Commission's web site:
http://www.fcc.gov/ccb/mcot/SBC_AIT/service_quality.

Given that a stated goal of this NPRM is the advancement of competition, the Commission is also directed to review the decline in service quality as provided CLECs subsequent to the Bell Atlantic/NYNEX merger as reflected in the data posted at:
http://www.fcc.gov/asd/BA_NYNEX/perfMonGraphs.html.

5. State sanctions have not been sufficient to ensure promised improvement. During hearings on the proposed SBC takeover of Ameritech, held in Illinois in January of 1999, Ameritech vice president for regulatory affairs David Gebhardt, acknowledged that for the previous four years Ameritech had paid multimillion dollar fines rather than upgrade or repair services to meet standards imposed by the Illinois Commerce Commission. (The fines had increased from \$4 million/year to the \$16 million fine imposed in 1999 for failure to restore lost phone service.)³

² See, discussion at pp. 130-131, including Table 2-63, *Survey and Analysis of the Telecommunications Quality-of-Service Preferences and Experiences of the Customers of Ohio Local Telephone Companies*, prepared under contract for the Public Utilities Commission of Ohio (July 1996).

³ See, Jon Van, *Ameritech repair bill: Millions in fines*, Chicago Tribune, Jan. 27, 1999, at Business Section 1.

Last year, heavily publicized and heavily attended regulatory and legislative hearings were held in the Ameritech region in response to growing public anger at continued and increasing service quality problems throughout the region. Fines were imposed. Yet service quality has not risen to reasonable levels. For example, in the state of Michigan, even though fines were paid and promises made, complaint levels against Ameritech as recently as January 2001, were *almost double* those reported one year ago (January 2000); *almost double* those in May, 2000, the month *before* legislative and regulatory investigations were launched in that state because of the serious decline in Ameritech's service quality.⁴

Ameritech continues to point its finger at the weather and insufficient work force levels as factors beyond its control.

"Weather prevents Ameritech from meeting recommended wait"⁵

By Amy Franklin 1/23/01

LANSING, Mich. (AP) -- Ameritech Michigan failed to live up to its promise that its customers would not have to wait longer than 36 hours for repairs by the end of 2000, a company spokeswoman said Tuesday. Ameritech ended last year with a 48-hour average wait for service repair because of severe cold weather throughout December and out-of-state technicians returning to their homes for the holidays, spokeswoman Amy Wood said.

While the 48-hour average wait on Dec. 31, 2000 is longer than the 36 hours Ameritech estimated in November, it's less than the 60 hours it told the Michigan Public Service Commission the wait would be back in September. Earlier last year, Ameritech did not believe it would be at the 36-hour mark until March 31, 2001.

Commission spokeswoman Mary Jo Kunkle says she doesn't know whether the company will face any kind of fine or action for failing to reach the state's recommended 36-hour standard wait for service by Dec. 31.

...

Ameritech Michigan also failed to meet its year-end target of 19,125 pending repair and installation orders. On Dec. 25, 2001, the company had 24,354 pending orders and 23,305 on Monday, Wood said.

"We've made subsequent progress in improving service in Michigan," Wood said. "And now we're getting back on track."

⁴ See, Attachment 1, Total Complaints Taken Monthly (Jan.00-Jan.01) as compiled by the staff of the Michigan Public Service Commission.

⁵ See, http://www.mlive.com/newsflash/index.ssf?/cgi-free/getstory_ssf.cgi?g9737_BC_MI--Ameritech-Service&&news&newsflash-michigan

Questions have also been raised in Illinois as illustrated in an article in the Internet edition of the Chicago Tribune.

“\$30 million fine leaves Ameritech customer service cold in December”

Inside Technology by Jon Van, [Chicago] Tribune Staff Writer

January 15, 2001. It may not be the biggest question as we enter the new millennium, but it's certainly a nagging one: Will Ameritech supply phone service reliably or are we in for a repeat of last year's nightmare? While Ameritech's management promises to win back customer confidence in the coming year, there are reasons for concern.

Last week, for instance, a report to the Illinois Commerce Commission showed that Ameritech failed the state's basic service requirements for the month of December. The state requires that Ameritech restore service to 95 percent of its customers who lose use of phones within 24 hours.

Because it fell far short of that goal last year, Ameritech must pay a \$30 million fine, which will come next month in the form of \$5 rebates on February phone bills. But management had pledged that by year's end, service would be restored to acceptable levels.

"We knew that Ameritech was going to miss its service goals for the year," said Richard Mathias, the ICC chairman. "But they said service would be at acceptable levels by January. I thought that meant they'd be in compliance with service standards for December, and they weren't."⁶

Questions have also been raised as to SBC/Ameritech's credibility given apparent discrepancies between statements made by its Chairman and Chief Executive Officer to Ameritech region regulators, and statements he made to Wall Street. NASUCA directs the Commission's attention to the letter dated Jan. 16, 2001, from the Chairman of the Illinois Commerce Commission (ICC) to regulators in other four Ameritech states *Re: Statements of Edward E. Whitacre, Jr. Chairman and Chief Executive Officer of SBC Communications, Inc.*⁷

⁶ <http://chicagotribune.com/tech/news/article/0,2669,ART-49219,FF.html>

⁷ See, <http://www.icc.state.il.us/icc/inside/cc/ops/010116cmletter.pdf>.

The three attachments to that correspondence can also be found at the same ICC web site:

1. <http://www.icc.state.il.us/icc/inside/cc/ops/010116cmletter1.pdf> (Transcript of ICC Open Meeting dated October 16, 2000, at which time SBC Whitacre testified.)
2. <http://www.icc.state.il.us/icc/inside/cc/ops/010116cmletter2.pdf> (Excerpts from SBC Analyst Teleconference of December 21, 2000.)
3. <http://www.icc.state.il.us/icc/inside/cc/ops/010116cmletter3.pdf> (Amounts paid by SBC-Illinois for Calendar Year 2000.)

As reported in the Internet edition of the Chicago Tribune:⁸

“SBC'S MESSAGES CALLED MIXED ON AMERITECH WOES”

By Jon Van

Wed, 17 Jan 2001. The state's top utility regulator says SBC Communications Inc. is talking out of both sides of its mouth in regards to Ameritech's service woes last year. Richard Mathias, chairman of the Illinois Commerce Commission, is asking his peers from Ameritech's five-state service region if they'd like another chance to publicly query SBC Communications officials --and get the real story behind Ameritech's service problems.

Specifically, Mathias said he's interested in resolving contradictions between what SBC officials told financial analysts last month about their subsidiary's travails and what they told state regulators in October.

In a letter sent Tuesday to colleagues in Wisconsin, Indiana, Michigan and Ohio, he suggested that regulators consider holding another joint session to question SBC Chairman Edward Whitacre Jr. about the contradictions. Mathias noted that in a December teleconference with analysts, Whitacre blamed "outside plant problems" for Ameritech's inability to repair and install lines in a timely fashion. Whitacre said a capacity shortage contributed to the problem "and perhaps in previous years not enough maintenance was done."

That's not exactly what he told the regulators in October, when he said "the root of the problem here is not money, it's the lack of qualified technicians and the lack of technicians."

In his letter to the heads of other state regulatory agencies, Mathias asked, "Would it be helpful to know whether the reasons for poor customer service are those given by SBC Chairman Whitacre to commissioners during the October meeting or those he gave to securities analysts during the December teleconference?"

An Ameritech spokesman said that there seems little reason for another joint session "because the original reason for the first session has, by and large, been addressed." The firm has hired hundreds of technicians, said Dave Pacholczyk, an Ameritech spokesman, and is performing at or close to service-quality goals.

Mathias has expressed skepticism that SBC's explanation for problems--unusually high demand for service and the surprise early retirements of many technicians--is the full account.

During hearings on service issues last year, Illinois Commissioner Terry Harvill asked Ameritech managers if deteriorating infrastructure also played a role in the service meltdown, but he was assured the infrastructure is in good shape.

In his letter Mathias noted that Ameritech seems to have improved service to retail customers since last fall, but that it still falls short in serving its competitive wholesale customers.

6. When assessing “economic burden”, consideration must also be given to the economic burden that outages and other service problems have on customers. Some ILECs in their Comments have made sweeping assertions of the burden posed by service quality reporting requirements. As stated in its initial Comments, NASUCA urges that such assertions be evaluated for what they are: generalized and unquantified statements ironically made at a time of historic high profit levels for these large ILECs.

In view of their assertions, NASUCA urges consideration of the other side of the economic burden ledger sheet: that economic burden borne by consumers as a result of outages, long installation and repair intervals, etc. A thought-provoking discussion and analysis are included in Attachment 2, a presentation to telecommunications industry representatives⁹ by Dr. Andrew P. Snow of Georgia State University.

Dr. Snow discusses an analysis he conducted of an outage in a downtown district of Atlanta in 1998.¹⁰ That outage is discussed from the carrier, the regulator and the user perspectives. This outage did not even meet the criteria of being a “large scale” outage for FCC reporting purposes. (It did not affect 30,000 lines.) Nor did it measure up as having a particularly severe impact based on the American National Standards Institute (ANSI) outage assessment metric used by the industry. That is what makes the results of the Snow analysis all the more telling from a public policy perspective. Clearly the economic losses and burdens it portrays would be exponentially still *more* dramatic with respect to “large scale” outages; would be even *more* exasperating as to those outages carriers could and should have prevented (such as failure to use diversity as discussed in NASUCA’s initial Comments).

⁹ speaking before the Committee T1-Telecommunications (T1A1.2) when it met in Boulder. Colorado May 2-4, 1999

¹⁰ BellSouth was not responsible for the outage that resulted when an electrical subcontractor cut 10,000 insulated copper pairs with an auger. It appears that for some customers the outage lasted eight days, the duration exacerbated by the electrical subcontractor having paved over the surface area making it more difficult for BellSouth to locate the site in that first twenty-four hours after the cable cut.

From surveys that Dr. Snow and his team conducted of customers in the affected business district the cost was often devastating (particularly for small business). Included were a travel agency, architectural firm, insurance company, interior design company, attorneys, printing company, dental clinic, and an engineering firm. Among the findings:

- ! A bakery adjacent to the district whose telephone lines were not affected, nonetheless incurred severe losses because its customers within that district were not able to call or fax in their orders.
- ! Half of the companies interviewed indicated their revenue losses were well over \$50,000.
- ! Some of the businesses identified
 - ! lost clients
 - ! had clients who thought it did not pay its telephone bills on time or had gone out of business
 - ! lost credibility for reliability
 - ! other variations of a damaged business reputation
 - ! reduced employee productivity, and
 - ! high frustration levels. Information provided by the carrier was typically inconsistent when customers repeatedly tried to determine the cause, expected duration and available options. The carrier had issued no reports or releases to the media...further frustrating customers in their attempts to secure needed information.
- ! inadequacy of cell phone alternatives for those who owned them; traffic levels in that district were so high as to routinely render that option inoperable

Among the many interesting aspects of this analysis:

- ! **BellSouth benefitted from having detailed performance data available.** In this instance, BellSouth was not responsible for the cable cut that caused the outage. Its concentration of so many lines in one site, although significantly affecting the scope and duration of the outage, was not a violation of any rule or regulation.¹¹ Yet BellSouth benefitted from having collected and compiled the data mandated for reportable outages. Without that data collected and made available for Dr. Snow's review, he could well have concluded that there was no valid reason for the 8-day delay in restoring service. He was able to confirm that the combination of such a high concentration of lines in one site and use of all-one-color multi-pair cables, dramatically slowed the process of restoring service. *But* Dr. Snow independently verified that both practices are routine in the industry and neither are prohibited by regulation. This outage was a public relations disaster for BellSouth in that business district, but it would have been an even worse

¹¹ There are those who contend this practice should be curtailed or prohibited. This "single-point-of-failure" issue continues to rage within service quality circles. The question is whether this practice should now be prohibited given the scope of loss that results when a problem arises that then affects a much larger number of lines than would be the case in the absence of such concentration. This factor is dramatically illustrated in the outage that occurred here in this business district of Atlanta. The scope of the cable cut was greatly magnified because of such line concentration. Consider that this was not even what is formally considered a "large-scale" outage.

public relations disaster if no such data were available so that an independent source could clear it of even harsher criticism.

- ! **The Telecommunications Industry Developed and Relies Upon Mathematical Models That Seriously Understate the Economic Impact of Outages on Customers.** Dr. Snow demonstrates that the mathematical matrix the industry formulated and relies upon in assessing “impact” of outages, grossly understate the economic impact because it understates the effect of duration and instead places near total emphasis on magnitude (i.e., the number of lines out of service).

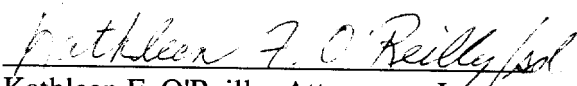
For purposes of this proceeding, Dr. Snow’s analysis underscores the importance of ensuring that preventable outages (such as those caused by lack of diversity) are at long last addressed. Dr. Snow’s analysis also illustrates how current discussions of economic impact of service quality reporting requirements are unfairly skewed in favor of the carrier; there is little if any empirical data as to the economic impact of outages on users.

7. **Basic Reporting Requirements Should Remain in Place Even After Effective Competition is in Place for All Residential Consumers.** NASUCA points out that even after the deregulation of the Savings & Loan Industry some twenty years ago, and the deregulation of the airline industry in 1980, various consumer protections remained in place; some were maintained as part of the transition to full competition, others were eventually streamlined but never eliminated (e.g., those related to lost luggage, mandatory reporting as to on-time performance, etc., as discussed in the NPRM).

Telecommunications customers deserve no less even after competition emerges. Once strengthened as to uniformity, they should still assist consumers in making informed decisions in the marketplace, thereby stimulating the fair competition envisioned by the federal act.

Conclusion NASUCA concludes that a persuasive record has been developed in this proceeding for the recommendations made in its initial Comments and those contained herein. It urges the Commission to prioritize in the months ahead, the right of all consumers to high quality service as promised in the federal act.

Respectfully submitted,

A handwritten signature in cursive script, reading "Kathleen F. O'Reilly".

Kathleen F. O'Reilly, Attorney at Law

on behalf of the

National Association of State Consumer Utility Advocates (NASUCA)

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Chairman, NASUCA

Telecommunications Committee

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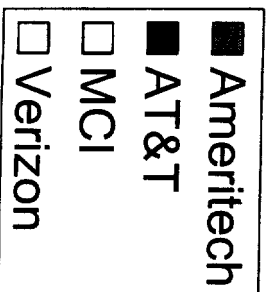
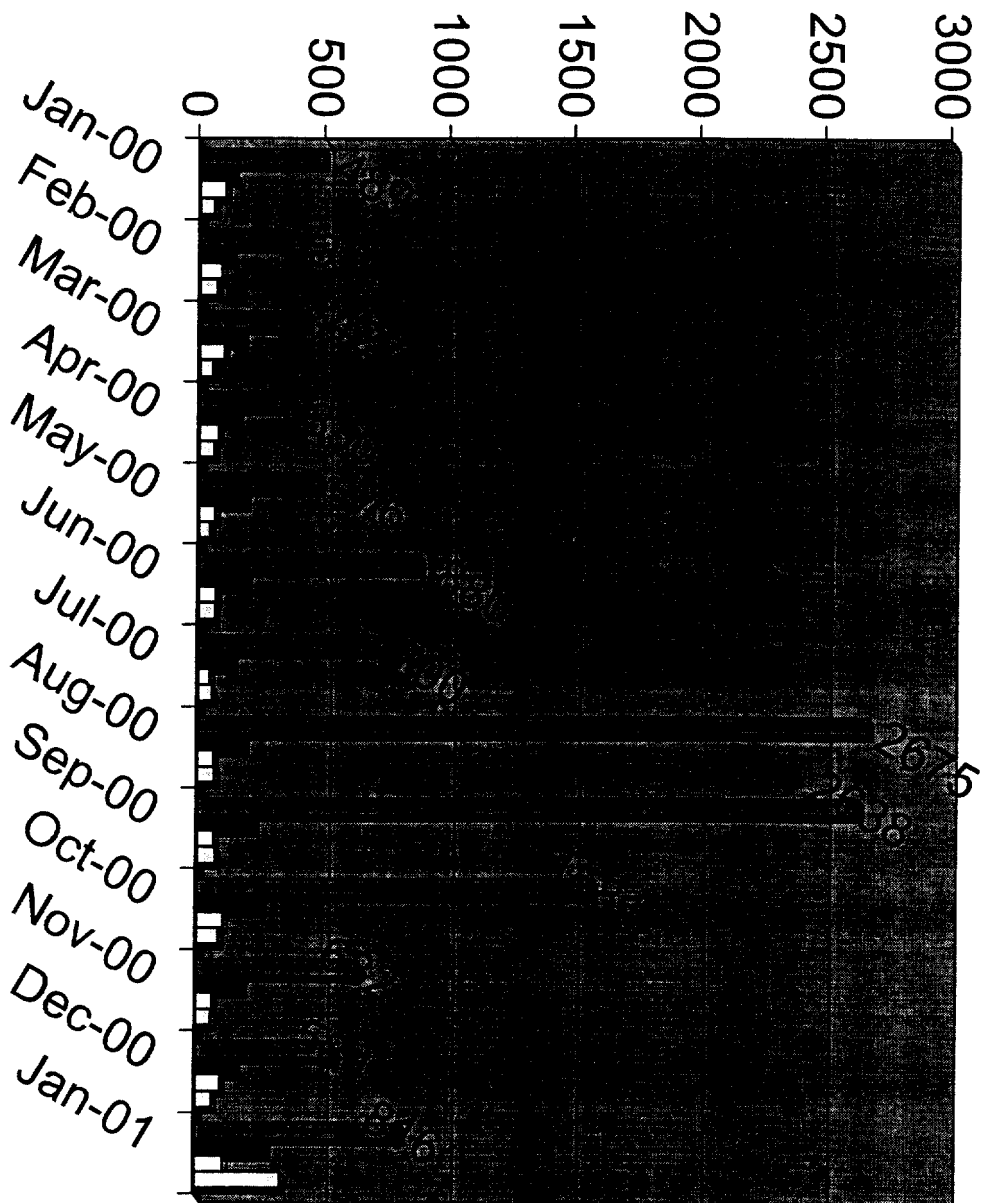
6 St. Paul Street, Suite 102

(410) 767-8150

Baltimore, MD 21202

Dated: February 16, 2001

Total Complaints Taken - Monthly



COMMITTEE T1 – TELECOMMUNICATIONS

T1A1.2

Boulder Colorado; May 2-4, 1999

CONTRIBUTION

TITLE: Carrier-Industry, FCC and User Perspectives of a Long Duration Outage:

Challenges In Characterizing Impact

SOURCE: Georgia State University, Department of Computer Information Systems

Andrew P. Snow and Carol C. Carver

PROJECT:

T1Q1-15

ABSTRACT

A wireline outage lasting over one week is analyzed from three perspectives. The carrier perspective is presented using the ANSI Outage-Index, while the FCC perspective is examined from lost Line-Hour and reporting threshold viewpoints. The user perspective is examined through a survey of business subscribers actually impacted by the outage. The carrier, FCC, and user perspectives are found to be in stark contrast. Various contradictions are presented regarding FCC reportable thresholds, in light of the magnitude and duration of this outage. The purpose of this contribution is to highlight the difficulties in adequately characterizing true outage impact. In particular, the Outage-Index is insensitive to large changes in outage duration, and gives too much weight to magnitude. Comparing the case-outage to two other 1998 long duration local switch outages reinforces this notion. In addition, statistics on long duration 1998 local switch outages are presented that indicate these events are not necessarily outliers, although the outage index treats them as such.

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Tel: 404-651-0879; Fax: 404-651-3842

INTRODUCTION

In the early morning hours of September 15, 1998 in a downtown business district, an electrical subcontractor cut 10,000 paper insulated copper pairs with an auger. Best estimates are that the outage lasted eight days for some subscribers.¹ The impact to affected business subscribers was large and sustained.

DISCUSSION

This outage is discussed from the carrier, FCC, and user perspectives. These perspectives are then compared, and the weaknesses of each discussed.² Lastly, some concluding remarks are made.

CARRIER PERSPECTIVE

The auger penetrated a cable distribution system, mangling eight 1200 pair cables about 1500 feet from the End Office. Four fiber optic cables were narrowly missed and were undamaged. The End office houses at least four switches, including a Nortel DMS-100 and a Lucent 5ESS, serving over 200,000 subscribers.

As the subcontractor evidently patched the hole in the street and left the scene, the LEC had to initially locate the cut, excavate, insure safety, assess the damage, and develop a recovery strategy, before starting repair. The crews had to hack through concrete, cobblestones, and trolley line ties. Recovery apparently did not start for 24 hours, and seven more days were required to pull new cables, and splice pair. Repair was one pair at a time, and tedious. The estimated outage-profile is shown in Figure 1. An exponential recovery is more likely, however a linear recovery estimate is used to depict the outage profile because the actual exponential recovery rate is not known.

The outage index for a single outage event, using the line method is:

$$OI = I_{ao} + I_{ro} + I_{rl} + I_{g11} = 0.53$$

where the four components represent the impact of losing IntraOffice, InterOffice, InterLATA, and E911 service, respectively. In this calculation, the magnitude weights and duration weights are applied as defined in TR24A [2] to the outage profile in Figure 1, for

¹ The size and duration of this outage is estimated through press accounts, interviews with state officials and impacted subscribers. Press accounts of the number of subscribers impacted conflict with other information, such as the apparent use of some pair gain technologies. However, the number of pair severed was corroborated by two sources. Only the Local Exchange Carrier knows the true extent of this outage, as it is not a FCC-reportable or an ARMIS-reportable total switch outage event.

² This contribution is based partly on the description of this outage presented in reference [1].

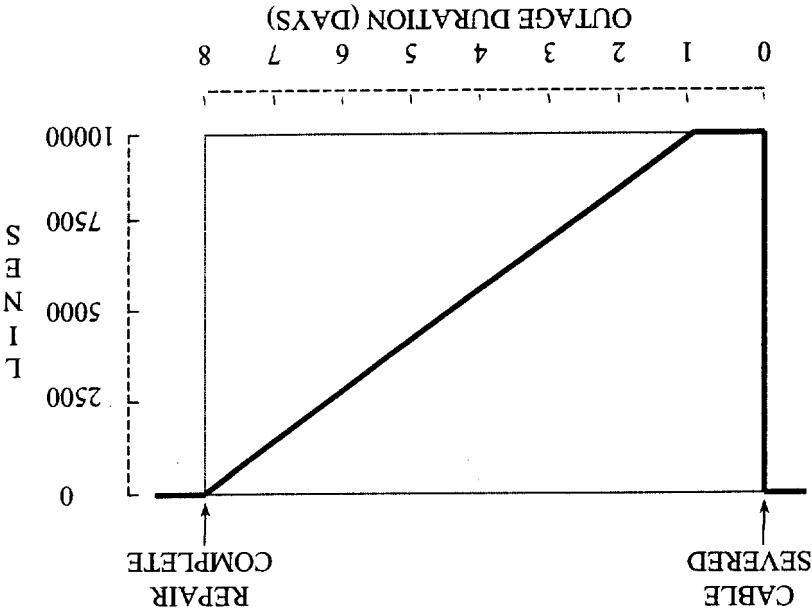
Another industry perspective is gained by comparing this outage to the end-to-end local access availability budget allotted to the distribution system (local loop). The carrier industry

Outages of magnitudes less than 30,000 have small magnitude weights. This results in a metric that is fairly meaningless to users, and has been criticized as being too "Carrier-Centric" [5]. In this instance, clearly the longer the duration, the larger the impact to users. This industry index simply does not adequately reflect escalating business impact for the type outage presented here.

- 10,000 out for one day - OI = 0.5186
- Figure 1 Outage profile - OI = 0.5285
- 10,000 out for eight days - OI = 0.5323

Note that this metric offers no intuitive "feel" as to actual user impact, although one might compare this value to the outage index of other outages. By comparison, an outage of a 30,000 line local switch lasting 30 minutes, affecting all four services, has an outage index of 1.92 [4]. One major problem with this index is that it is insensitive to changes in duration, for long duration outages such as this one (the duration weight has an asymptotic limit of 2.5, 90% of which is reached at 480 minutes). In fact, the outage index varies little whether this outage was one day or eight days in duration. For example:

Figure 1. Outage Profile



gradual restoration of service outlined in TR42 [3]. The time factor (TF) is 1.0 for this outage, as this is the largest TF encountered over the outage period, as stipulated in TR24A.

availability standard for local switch distribution systems is 0.9999, or 53 minutes outage per year [6]. For those users experiencing an outage of eight days, 217 years of local wire distribution unavailability budget has been expended in this outage.

FCC PERSPECTIVE

The FCC requires certain outages to be publicly reported by carriers. Large-scale outages, called FCC-reportable outages, are those affecting at least 30,000 users for at least 30 minutes, and must be reported [7]. Another way to look at this reporting threshold is that it is equivalent to 15,000 subscribers losing service for one hour, referred to as 15,000 lost line-hours (30,000 users times 0.5 hours).

For this outage, we may calculate the equivalent lost line-hours by calculating the area presented in the outage profile in Figure 1:

- 1 day (24 hours) x 10,000 subscribers = 240,000 line-hours
- $1/2 \times 7 \text{ days} (168 \text{ hours}) \times 10,000 = 840,000 \text{ line-hours}$
- Total Lost Communications = 1,080,000 line-hours

From a lost line-hour perspective, this outage event is of massive proportion. However, it is not an FCC-reportable event because at least 30,000 subscribers were not affected. If we apply the time factors defined by ANSI to these line hours, this outage would still be equivalent to 450,226 lost line-hours during the prime of the business day, 8:00 a.m. to 3:59 p.m. Classifying a 450,226 line-hour outage as not reportable, while other outages of 15,000 line-hours are reportable seems contradictory.

This line-hour perspective is also in stark contrast to that perceived by the industry, whereby this outage (10,000 affected for 24 hours, and not being totally repaired for 7 more days) would be viewed as having an outage index of 0.53, and an outage of 30,000 lines out for 30 minutes would have an outage index of 1.92. This too seems contradictory. It is an example of the imbalance between magnitude and duration weights in the outage index.

Is this outage an outlier? As mentioned earlier, the duration weight within this index reaches 90% of its asymptotic limit at 480 minutes. In 1998, 63 reported local switch outages exceeded 480 minutes (and range up to 10,080 minutes). Of these, 35 are over 15,000 line-hours (obtained from FCC ARMIS 4305 IVa. filings for 1998).

We may also compare this outage to two other 1998 local switch outages, as seen in Table 1. Note that the Outage-A index is about 1/7 of Outage-B, and about 1/27 of Outage-C, even though the three outages are fairly comparable from a line-hours perspective. This illustrates the insensitivity of the index to long duration outages and its bias towards magnitude.

³ This is the case-outage for which the outage profile is shown in Figure 1

Downtown streets were blocked off, traffic rerouted by detour, and traffic lights re-timed to ease congestion, as the cut occurred near the middle of a major downtown intersection. One company was adversely affected, even though their telephone service was not. This store, located on a block adjacent to the outage, usually received telephone and fax orders during the lunch hour. Many customers, aware of the proximity of the restaurant to the street

for up to 8 days. companies had service restored after 2 or 3 days, and a few were without telephone service government offices, and an entire college faculty, administrators, staff, and students. Some wide variety of businesses were impacted, including banks, print shops, attorneys, from the spared fiber optics were still in service. Based upon a limited survey conducted, a disaster"[1]. In some blocks, service was out for many, while others deriving connection The impact to small businesses was particularly devastating, with some calling the event "a

account numbers or balances, or do credit checks."[1]. computers and fax machines, employees can't honor cash advances, look up customer had hundreds of lines out, causing major problems for their operations as "without phones, businesses and apartments affected. Some affected businesses, such as a large bank branch, press reports said that telephone company officials could not initially quantify the number of As a result of this cut, many businesses in the area were without telephone service. Initial

USER PERSPECTIVE

Table 1. Outage Comparison

DESCRIPTION	OUTAGE-A LINE-CUT ³	OUTAGE-B SCHEDULED	OUTAGE-C HARDWARE
DATE	9/15/98	9/23/98	10/13/98
DURATION (minutes)	Up to 8 days (11,520)	4,106	2,070
LINES	Up to 10,000	28,871	50,877
DURATION WEIGHT	COMPLEX	2.48	2.46
MAGNITUDE WEIGHT	COMPLEX	0.19	0.70
OUTAGE INDEX	0.53	3.82	13.67
LINE-HOURS	1,080,000	1,838,872	1,755,257
ARMIS-REPORTABLE	NO	YES	YES
FCC-REPORTABLE	NO	NO	YES

excavation, assumed the company had no telephone service. Consequently, during the period of the outage, many people did not call in or fax orders. The owner of the store said "This thing is killing my business." [1].

In order to understand the impact of such an outage on users, a survey was conducted of businesses in the affected areas. The survey method used was structured interviews, with a questionnaire. Scientific sampling was not used for this initial survey, as the exact geographic extent of the outage was not clearly understood at that juncture. Those businesses interviewed were those willing to spend time with the researchers, and were located by press accounts, referrals, and canvassing. As such, these results are exploratory research, which should enable a more rigorous approach in the future.

From the survey, the telephone outage affected businesses in a four-block downtown area. This area consists of a series of high rise buildings occupied by a variety of businesses, as well as by apartments. A sample of different business types was interviewed to determine the impact of the outage. A summary of the business types and their stated impact factors are in Table 2. A majority of these small businesses stated that the economic loss due to this outage was in excess of \$50,000.

Type	Firm	Lost Revenue	Lost Clients	Reduced Client Service	Credibility Affected	Lost Employee Productivity	High Level of Frustration
Architect		✓	✓	✓	✓	✓	✓
Attorney		✓	✓	✓			
Dental Clinic				✓		✓	✓
Engineering		✓			✓	✓	✓
Insurance		✓		✓		✓	✓
Interior Design				✓		✓	✓
Printing Co.		✓	✓	✓		✓	✓
Travel Agency		✓	✓	✓		✓	✓

Table 2. Telephone Outage Impact Factors Identified by Businesses

The survey results are informative, but not entirely satisfactory. First, the impact to residential users is not addressed. Second, the sample population was not randomly selected. Lastly, when presented choices in depicting economic impact, "\$50,000 or greater" was the highest choice on the scale; this may have masked greater economic impact. However, survey results indicate that an impact metric such as "dollars lost per line per hour" merit further investigation.

CONCLUDING REMARKS

Based upon the analysis presented, we see that assessing the true impact of an outage, from a user perspective, is difficult for telecommunication carriers. Homogenous, uniform metrics such as the outage index may be easy to apply, but our qualitative survey of businesses indicates gross underestimation of impact. By example, we show that this underestimation is due not only to the imbalance between duration and magnitude weight, but also the questionable rapidity with which the duration weight approaches its asymptotic limit. The asymptotic limit of weights was probably applied to control outliers, for trend analysis purposes. If this conjecture is correct, the price paid is the apparent underestimation of very significant outages. This is especially ironic, as survivability measurement should highlight outliers, not smooth them. By smoothing high impact outages, true survivability weaknesses might be masked. These results also reinforce the findings in [5] that the outage index is an inadequate measure for certain outages. The industry should consider a more "user-centric" index, and more research is required to develop an adequate metric.

The outage index was originally designed for FCC-reportable outages. This greatly influenced the mathematical definition of the magnitude and duration weights. Here, we see that very high impact outages occur under the FCC-reportable threshold. This places into question the relevance of the S-shaped curve inflection points, which are used to define magnitude and duration weights. As the outage-index is claimed to be a universal metric for measuring telecommunication outage impact, the weight definitions should be revisited. Special consideration should be given to an infinite duration weight model, rather than the asymptotic model used. A rapidly converging finite duration weight ignores the escalating impact of a long duration outage, as demonstrated in this contribution.

PROPOSAL

The following recommendations are made with respect to TR24A and TR42:

- The rapidity with which the duration weight approaches its asymptotic limit should be reexamined; alternately, an infinite duration weight model should be considered.
- The imbalance between magnitude and duration weight should be reexamined.
- The outage index should not be touted as being user-oriented as a case may be made that it is carrier-centric. In addition, as defined, the outage index should not be referred to as a universal way to measure telecommunications impact.
- More research is needed to assess user impact, especially from the business and residential user perspectives. In particular, economic loss models should be investigated. Also, research into measuring business/residential mix is needed.

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